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METHOD AND APPARATUS FOR DISPLAYING TELEVISION PROGRAMS AND RELATED TEXT

Background of the Invention

This invention relates to the field of television and, more particularly, to a method and apparatus for simultaneously displaying video programs and related text on a television screen.

For a number of years television receivers have been equipped with picture-in-picture (PIP) capability. In PIP format, the moving, real time images of one television channel are displayed on the background of the screen and the moving, real time images of another television channel are displayed in a PIP window overlaid on a small area of the background. Because two channels are simultaneously displayed by the television receiver, two tuners are required. The viewer enters the PIP mode by pressing a PIP key of his or her controller. Then, the viewer can change either the channel of the background or the channel of the PIP by resetting the appropriate tuner. To reverse the background and PIP images, the viewer simply presses a SWAP key. To collapse the PIP window, the viewer again presses the PIP key.

Television program guides help television viewers select programs to watch. Such television program guides list the available television programs by day of the week, time of day, channel, and program title. For many years television program guides have been published in hard copy

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1   form. More recently as illustrated by Levine Patent 4,908,713, television program guides have begun to take an electronic form. In other words, the schedule of program listings is stored in an electronic memory connected to
5   the television receiver. The program listings are recalled from memory by the viewer on command for display on the television screen.

     Despite the prevalence of television program guides, many viewers still make their program selections by
10   switching the television tuner from channel to channel and observing on the screen what program is being received on the respective channels. This process is sometimes called "grazing."

     Emanuel Patent 5,161,019 discloses an automated form
15   of channel grazing. A preselected group of channels are sequentially scanned by switching the tuner of the television receiver from channel to channel. A still image of the program received on each channel is stored in a memory. After all the channels have been scanned, the
20   still images from all the channels are simultaneously displayed on the television screen. This process gives the viewer more information about the program choices in addition to that obtainable from a television program guide, namely, the displayed still images of the actual
25   programs.

Summary of the Invention

     According to the invention, moving images of a television program, and are displayed in a PIP window on
30   the screen of a television monitor and textual information related to the television program is displayed in the background on the screen. Preferably, the audio portion of the television program displayed in the PIP window is also reproduced by the sound system of the television
35   monitor. The textual information is arranged on the screen so none of it is covered by the moving images.

In one embodiment, the textual program related information (PRI) is a television program schedule. One of the program listings of the schedule identifies by title and time and/or channel the television program in the PIP window, which comprises moving images.

To facilitate channel grazing, a television viewer can use a PIP format for display of current television program listings from a program schedule data base in the background and moving, real time images of a program selected from the displayed listings in the PIP window. Specifically, as the viewer selects a particular program from the displayed current television program listings by means of a cursor or a code number, the corresponding program automatically appears in the PIP window. In this way, the user can channel graze by sequentially selecting the individual program listings in the background. When the user finds a program that the user wishes to watch, the user can reverse the background and PIP window and then collapse the window, leaving the desired program on the full screen.

To permit the viewing of programs scheduled for the future broadcast without losing sight of the current program being watched, a television viewer can use a PIP format for display of television program listings for a specific channel from a program schedule data base in the background and moving, real time images of the current program on that channel in the PIP window. Specifically, as the viewer changes channels, the current program on that channel automatically appears in the PIP window. The viewer can control the background to display program listings for a period of days, i.e., a week, in the future. In this way, the user can continue to watch a television program while ascertaining the future programs on the channel to which the television tuner is set. When the viewer finds a program that the viewer wishes to watch, the background disappears, leaving the program on the channel to which the tuner is set on the full screen.

1   In another embodiment, a television viewer can use a
        PIP format for display of future television program from
        a program schedule data base in the background and moving,
        images of a video clip of a program listing in the
5   background display selected for example by a cursor.
            In yet another embodiment, the textual program
        related information (PRI) is a message that is broadcast
        in the vertical blanking interval of the television signal
        contemporaneously with the television program displayed in
10   the PIP window.

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1   **Brief Description of the Drawings**
        The features of specific embodiments of the best mode
     contemplated of carrying out the invention are illustrated
     in the drawings, in which:
5   FIG. 1 is a schematic block diagram of a television
     receiver incorporating the principles of one embodiment of
     the invention;
         FIGS. 2, 3, and 4 are television screens formatted in
     accordance with the embodiment of FIG. 1;
10   FIG. 5 is a schematic block diagram of part of a
     television receiver incorporating the principles of
     another embodiment of the invention;
         FIGS. 6 and 7 are television screens formatted in
     accordance with the embodiment of FIG. 5; and
15   FIG. 8 is a television screen formatted to simulate
     a picture-in-picture window.

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Detailed Description of a Specific Embodiment

      In the following description of the embodiments of
the invention, common reference numerals are used to
represent the same components. If the features of all the
5   embodiments are incorporated into a single system, these
components can be shared and perform all the functions of
the described embodiments.

      With reference to FIG. 1 in a current program guide
(CPG) mode, a source of television signals 10 such as a
10   terrestrial antenna, a satellite antenna, or a cable is
connected to a television tuner 12. The output of tuner
12 is a video signal, i.e., a base band or unmodulated
signal, coupled to the video input of a video cassette
recorder (VCR) 60. (Alternatively, television signal
15   source 10 could be directly connected to the RF input of
VCR 16, if its internal tuner is to be utilized.) Tuner
12 is directly connected to one input of a switch 14 and
is connected to the other input of switch 14 through VCR
60. The output of switch 14 is connected to one input of
20   a conventional picture-in-picture (PIP) integrated circuit
chip 18. The output of PIP chip 18 is connected to the
video input of a television receiver or monitor 20 having
a screen (not shown).

      An updatable data base of the schedule of program
25   listings of all the available channels for a prescribed
period of time, e.g. one week, is electronically stored in
a program schedule memory 22. These program listings
typically include for each program the title, a brief
program description, the day of the week, the time of the
30   day, and the channel on which the program is transmitted
and thus available for reception at source 10. The data
base can be updated by a continuous data link in the
vertical blanking interval (VBI) of one television channel
broadcast to the television receiver in well know fashion.
35   Alternatively, the data base can be updated by unplugging
memory 22 and replacing it with a memory having the
updated data base. Memory 22 is connected to a

microprocessor 24 that is programmed to control the operation of the described equipment. An operating program for microprocessor 24 is stored in a read only memory (ROM) 26. A viewer input device 28, preferably in the form of a remote IR controller, is coupled to microprocessor 24 to provide commands from the viewer. A video processor 30 is coupled to microprocessor 24. When the viewer wishes to see television program listings, microprocessor 24 recalls a portion of the program schedule data base from memory 22 and couples it to video processor 30, where the program listings are formatted for display. Video processor 30 is connected to the other input of PIP chip 18. Preferably, input device 28 controls microprocessor 24 by cursor movement on the screen of television receiver 20. To this end, microprocessor 24 and video processor 30 are coupled to a cursor position register 32. (Alternatively, the viewer can select items of information displayed on the screen by keying into viewer input device 24 code numbers assigned to these items.) Microprocessor 24 is also coupled to tuner 12 for channel change, to VCR 16 for play/record selection and start/stop, to switch 14 for selection of one of its inputs, and to PIP chip 18 for selection of the mode of PIP operation.

In FIG. 2, the screen format in the CPG mode comprises a background area 40 and an overlaid PIP window 42 in the upper right hand corner of the screen. Background area 40 includes a banner area 43 at the top of the screen, a program description area 44 in the upper left hand corner of the screen adjacent to PIP window 42, and a program schedule area 46 in the form of a time-channel grid below areas 42 and 44. Banner area 43 contains the day of the week, the time of day, and other identifying information. All three of these areas of the background are formatted in video processor 30. The memory space of video processor 30 corresponding to the area in which PIP window 42 appears on the screen is left

blank; i.e., although overlaid on background area 40, PIP
window 42   does not cover up any of the information of
background area 40.   The channel numbers or names are
displayed in a column on the left side of area 46 and the
time of day is displayed in a row at the top of area 46.
By means of a cursor control key set on input device 28
such as a pair of up/down arrows, the viewer can move a
cursor 48 vertically to highlight the title of one of the
currently playing television programs displayed on area
46.   When the cursor reaches the top or bottom of the grid
in area 46, microprocessor 24 recalls further program
listings from program schedule memory and video processor
30 formats these program listings so further channels
either above "HBO" or below "Disc" in the program schedule
layout can be displayed.   The moving, real time images of
the current television program highlighted by cursor 48
are displayed in PIP window 42 and the program description
of the highlighted program is displayed in area 44.
Preferably, the audio portion of the television program
displayed in PIP window 42 is also reproduced by the sound
system of monitor 20.   The PIP display and the program
description in area 44 enable the viewer to assess better
whether or not to watch the highlighted program.   As the
viewer moves cursor 48 vertically from channel to channel,
the current television program displayed in window 42 and
the program description displayed in area 44 automatically
change accordingly to match the highlighted program in
area 46.   As the cursor moves from channel to channel,
microprocessor 24 recalls the program description for the
highlighted program from program schedule memory 22 and
video processor 30 formats this program description so it
can be displayed in area 44.

It should be noted that the display of future program
listings in area 46 is not necessary to practice the
invention.   Therefore, the program schedule displayed in
area 46 in the CPG mode presented in a different format,

1   e.g., separate vertical columns for channel, program
         title, start time, and ending time.

              In the program schedule memory, the program listings
         are coded by day of the week, time of day, and channel so
5   that they can be accessed by microprocessor 24 when
         necessary to supply program schedule data to video
         processor 30 to compose the time-channel grid and the
         program descriptions. Microprocessor 24 has a real time
         clock (not shown) the time of which is compared with the
10   time of day and day of the week codes to select the
         program listings for the CPG mode. The functional storage
         areas of cursor position register 32 are mapped to the
         storage areas of vector processor 30 where the program
         schedule is formatted for display on screen area 40 so
15   cursor position register 32 points to the area of the
         screen, and thus the particular program, that is
         highlighted by cursor 48. By comparing the cursor
         position in register 32 with the channel corresponding to
         the highlighted area of video processor 30, the channel of
20   the highlighted program is derived and coupled to
         microprocessor 24. Microprocessor 24 then sets tuner 12
         to this channel.

              In operation, starting from a full screen display of
         the real time television program, the viewer first
25   depresses a CPG mode key on input device 28 to set up the
         format shown in FIG. 2. Microprocessor 24 recalls the
         appropriate program listings from memory 22 and transmits
         them to video processor 30 where the time-channel grid of
         area 46 and the program description of the highlighted
30   program in area 44 are composed. At the same time,
         microprocessor 24 operates switch 14 so the output of
         tuner 12 is directly connected to the one input of PIP
         chip 18 and switches PIP chip 18 into a PIP mode, such
         that the input from tuner 12 is displayed in the PIP
35   window and the program schedule from video processor 30 is
         displayed in the background. Microprocessor 24 senses the
         channel to which the tuner is set at when the CPG mode is

1   entered, and initially positions cursor 48 at the title of
     the program broadcast on this channel. As the viewer
     moves the up/down arrows of the cursor control key set,
     tuner 12 is reset accordingly and new program schedule
5   information is fed through microprocessor 24 to video
     processor 30 to recompose the time-channel guide so cursor
     48 remains visible and the program description remains
     current.   The described CPG mode facilities channel
     grazing by the viewer. When the viewer finds the video
10   program he or she wishes to watch, the viewer presses the
     CPG mode key again.   As a result, microprocessor 24
     switches PIP chip 18 out of the PIP mode, such that the
     video program inputted from tuner 12 is displayed full
     screen.

15   If the viewer wishes to record the program
     highlighted in the CPG mode, the viewer commands
     microprocessor 24 to turn on VCR 16 for recording.

          If the viewer wishes to play a video tape cassette on
     VCR 16, the viewer commands microprocessor 24 to turn on
20   VCR for playback and to operate switch 14 for connection
     of the output of VCR 16 through PIP chip 18 to television
     receiver 20.

          The television receiver of FIG. 1 can also be
     operated in a channel specific guide (CSG) mode. In FIG.
25   3, the screen format in the CSG mode comprises in addition
     to PIP window 42, banner area 43, and program description
     area 44, a program schedule area 50 in the form of
     vertical columns of the current day's times and program
     titles for the channel to which the tuner is set. In this
30   mode, banner area 43 includes the channel number and/or
     name and real time images of the current television
     program on the channel are displayed in PIP window 42.

          In operation, starting from a full screen display of
     the real time television program, the viewer first
35   depresses a CSG mode key on input device 28 to set up the
     format shown in FIG. 3.   Microprocessor 24 senses the
     channel to which the tuner is set when the CPG mode is

entered to select the program schedule listings for area 50. Microprocessor 24 recalls the appropriate program listings from memory 22 and transmits them to video processor 30 where the time and title columns of area 50 and the program description of the highlighted program in area 44 are composed. At the same time, microprocessor 24 operates switch 14 so the output of tuner 12 is directly connected to the one input of PIP chip 18 and switches PIP chip 18 into a PIP mode, such that the input from tuner 12 is displayed in the PIP window and the program schedule from video processor 30 is displayed in the background. If the program listings for the day extend to a number of screens, the viewer presses a next screen key until the desired program listings are displayed; the screens recycle in time order. To see another day's program listings for the same channel, the viewer presses a next day key until the desired day is displayed and to return to the current day the viewer presses the next day key until the schedule recycles, e.g., seven days. In summary, the program schedule listings for the channel to which tuner 12 is set are displayed in area 50, a description of future programming on this channel is displayed in area 44, and the real time television program for this channel is displayed in PIP window 42.

When the viewer changes channels, the program listings for the new channel are displayed in area 50, a description of future programming on the new channel is displayed in area 44, and the real time television program for the new channel is displayed in PIP window 42. Thus, by moving from channel to channel in this mode, the viewer sees the real time television program on selected channel and the program schedule listings and a description of future programming for that channel. The described CSG mode permits the viewer to see the program schedule listings for a channel without losing sight of any of the image of the real time television program on the channel.

When the viewer finds the video program he or she wishes to watch, the viewer presses the CSG key again. As a result, microprocessor 24 switches PIP chip 18 out of the PIP mode, such that the video program inputted from tuner 12 is displayed full screen.

The television receiver of FIG. 1 can also be used with the format of FIG. 3 in an extension of the CSG mode to display previews of future programming as video clips. The video clips are stored on a video tape cassette that is loaded into VCR 16. The addresses of the video clips on the tape of the video cassette are stored in program schedule memory 22 as part of the data base. These addresses are linked to the respective future program listings in the data base so that a video clip can be accessed on the tape when a program listing is designated in the database. When the viewer presses the CSG mode key, in addition to the operation as described in connection with FIG. 3, microprocessor 24 highlights the current program title with cursor 48, as illustrated in FIG. 3. So long as cursor 48 highlights the title of the current program, the CSG mode operates as described above. When the viewer moves cursor 48 vertically by operating the cursor control key set on input device 28 to highlight the title of a future program displayed in area 50, the address of the video clip of the highlighted program listing is retrieved by microprocessor 24 from program schedule memory 22 and transmitted to VCR 16. The video clip is retrieved from the tape in VCR 16 and coupled through switch 14 and PPI chip 18 to television receiver 24 for display in PIP window 42. The video clips on the tape of the videocassette are indexed and accessed in the manner described in copending application Serial No. 08/176,852, filed on December 30, 1993 and entitled ENHANCING OPERATIONS OF VIDEOTAPE CASSETTE PLAYERS, the disclosure of which is incorporated fully herein by reference.

An extension of the CPG mode illustrated in FIG. 2 also permits display of video clips of future programming. Specifically, in the time-channel grid format microprocessor 24 also controls cursor 48 responsive to the cursor key set of viewer input device 28, which in this embodiment includes a horizontal cursor control, such as a pair of right/left arrows. As described above, the address for the highlighted future program listing is retrieved by microprocessor 24 from program schedule memory 22 and transmitted to VCR 16 to access the corresponding video clip, which is displayed in PIP window 42.

Another embodiment in which video clips can be displayed in PIP window 42 is illustrated in FIG. 4. In addition to banner area 43 and program description area 44, background area 40 has program schedule area 52, in which program listings are displayed by theme such as movies, sports, current events, etc. Area 52 contains a column for program start time, a column for program channel, and a column for program title. To implement this embodiment, the program listings of the data base stored in program schedule memory 22 are also coded by theme so that they can be accessed by microprocessor 24 in response to the user selection of themes from an on-screen menu in well known fashion. As described in connection with the extended CPG and CSG modes described above, when the title of a future program listing is highlighted by cursor 48, the corresponding moving image video clip is displayed in PIP window 42. If desired, a video disc player could be substituted for VCR 16 to provide the video clips to switch 14 in order to speed up the access time to the moving images displayed in PIP window 42.

In another embodiment, program related information (PRI) is displayed in background area 40 while the real time television program to which the PRI relates is displayed in PIP window 42. The PRI is transmitted in the vertical blanking interval (VBI) of the television signal

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1   of the channel carrying the television program to which
     the PRI relates, contemporaneously with this television
     program. As illustrated in FIG. 5, to implement this
     embodiment a VIB decoder 54 is connected between the
5   output of tuner 12 and microprocessor 24 and a PRI memory
     56 is connected to microprocessor 24. The PRI is stripped
     from the VBI of the television signal by decoder 54 and
     stored in memory 56 by microprocessor 24.
          In operation, when the viewer presses a PRI key on
10   viewer input device 28 the real time television program of
     the channel to which tuner 12 is set, is displayed in PIP
     window 42. In addition to banner area 43 and program
     description area 44, background area 40 has a PRI area 58
     in which different types of PRI are displayed. In FIG. 6
15   the   real   time   television   program   is   a   cooking
     demonstration by Julia Child and the PRI displayed in area
     58 is a recipe made in the course of the demonstration.
     Other information about the program is displayed in area
     44. In FIG. 7 the real time television program is a
20   commercial for Lexis automobile and the PRI displayed in
     area 58 is a test drive offer for Lexis. The name and
     address of the local Lexis dealer in the geographic area
     of the viewer is displayed in area 44.
          As illustrated in FIG. 8, if the viewer does not have
25   a television receiver with a PIP chip, the same screen
     format is still displayed in the CPG, CSG and PRI modes.
     Text composed in video processor 30 is displayed in PIP
     window 42 instead of moving real time or video clip
     images. For example, in any of the described modes the
30   displayed information could be locally derived, such as
     time of day or received in the VBI such as weather,
     traffic, or news headlines.

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